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Tignat et al.

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(54) **PACKAGING FOR TRANSPORTING AND/OR STORING RADIOACTIVE MATERIALS HAVING A DESIGN THAT FACILITATES THE HANDLING OF THE MASS OF RADIOACTIVE MATERIALS**

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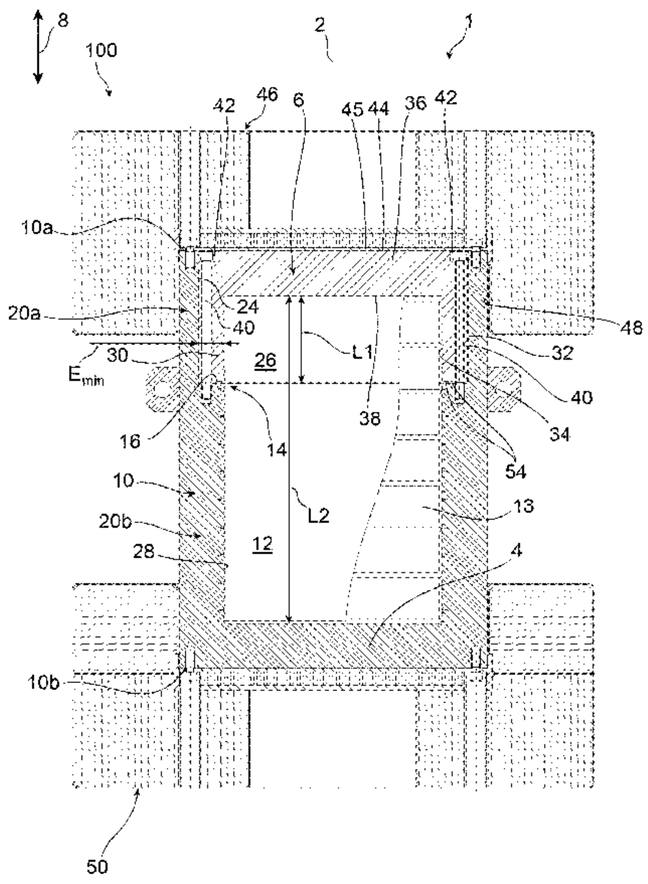
(57) **ABSTRACT**

A packaging for transporting and/or storing radioactive materials, the lateral body of which has a thickness change zone defining a transition surface, and including a portion of reduced thickness extending from the transition surface towards a first axial end of the lateral body, this portion of reduced thickness including an inner surface laterally delimiting a recessed zone of the lateral body, also delimited axially by the transition surface. Moreover, the packaging includes a portion reconstituting the lateral body extending around the longitudinal axis, arranged removably in the recessed zone, and having an inner surface that laterally delimits a portion of the housing cavity intended to receive the mass of radioactive materials.

14 Claims, 5 Drawing Sheets



(58) **Field of Classification Search**
USPC 250/505.1, 506.1, 507.1, 515.1, 516.1, 250/517.1, 518.1, 519.1
See application file for complete search history.

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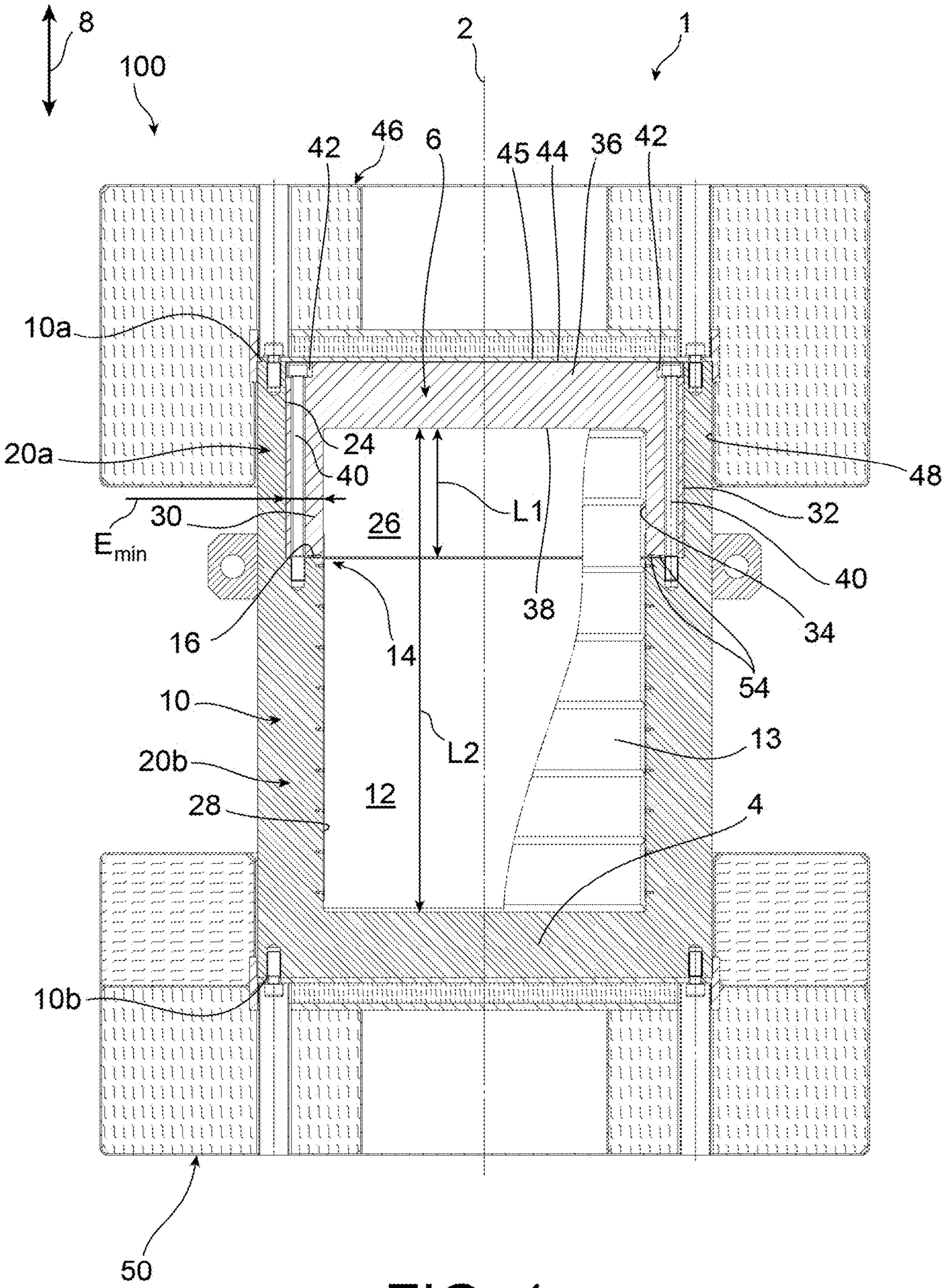
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FIG. 1

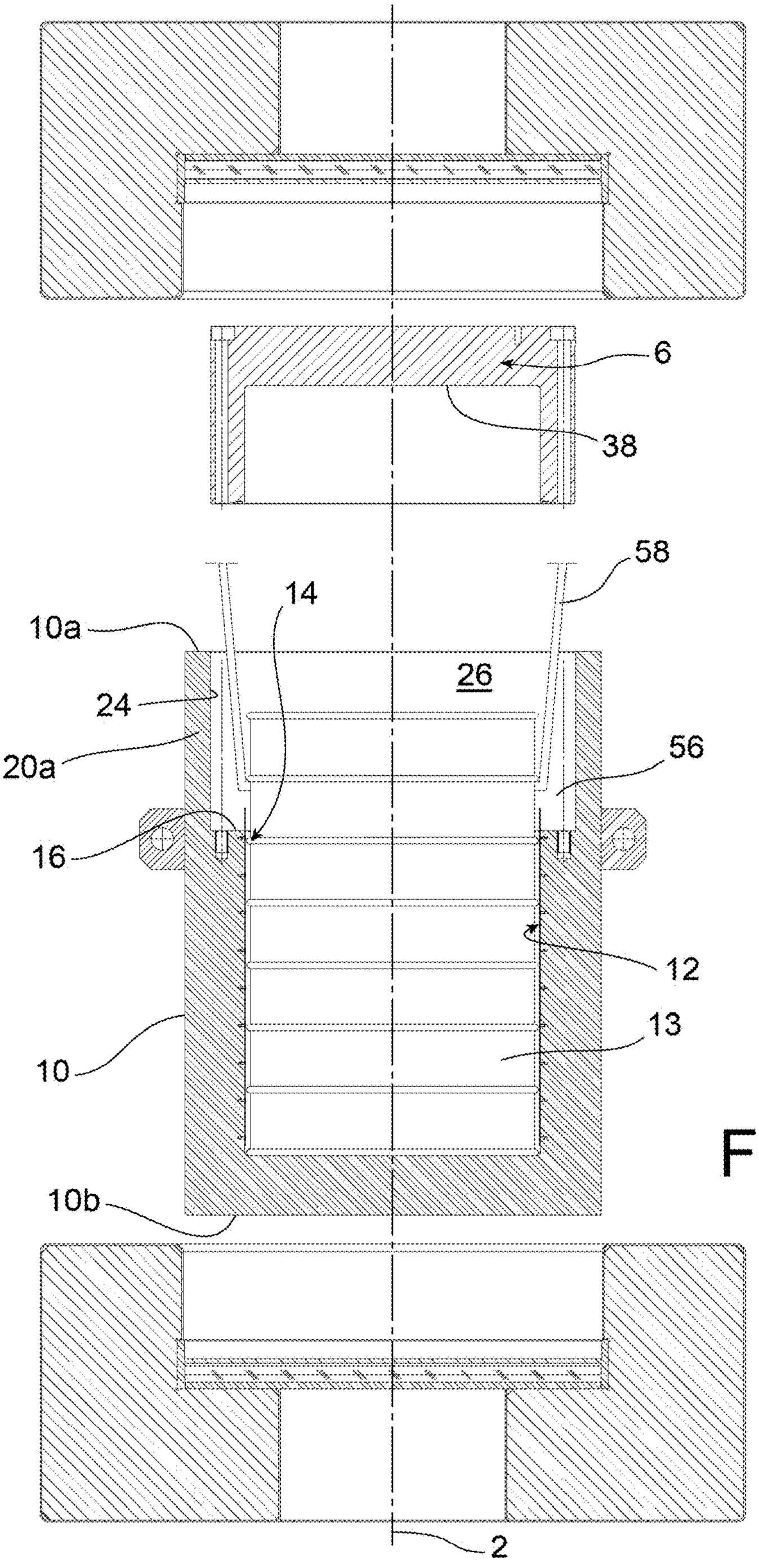

FIG. 2

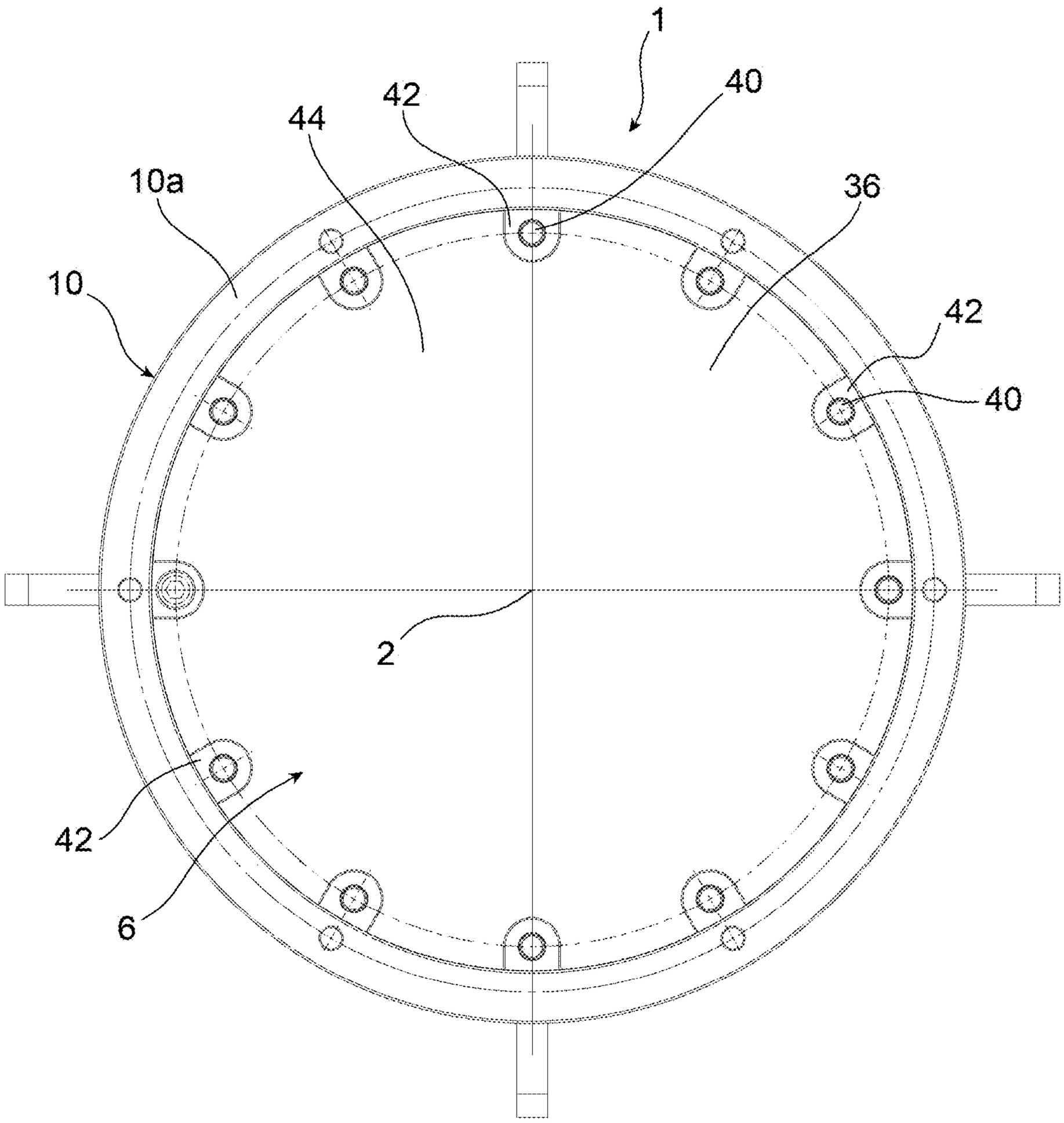

FIG. 3

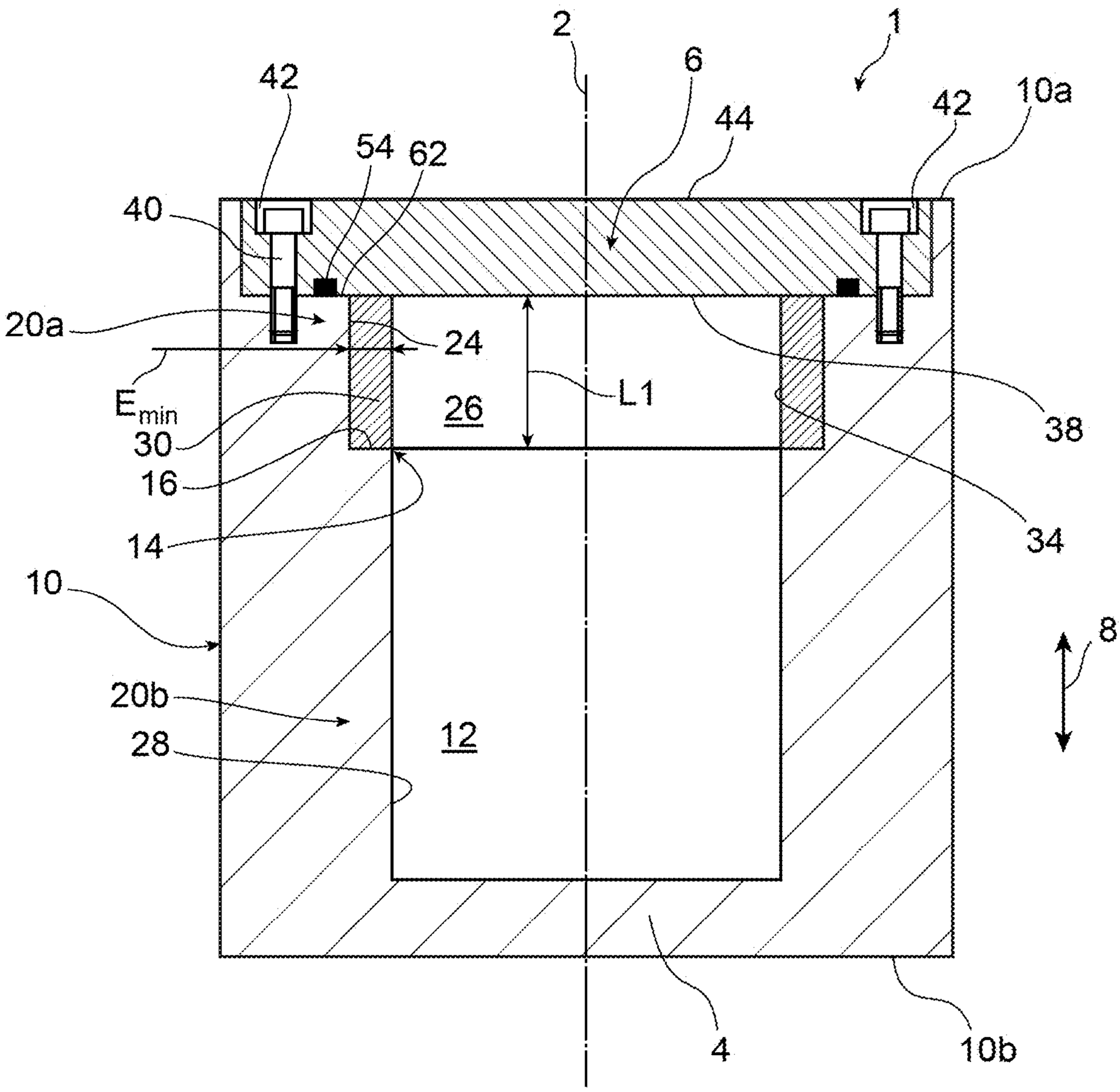
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FIG. 4

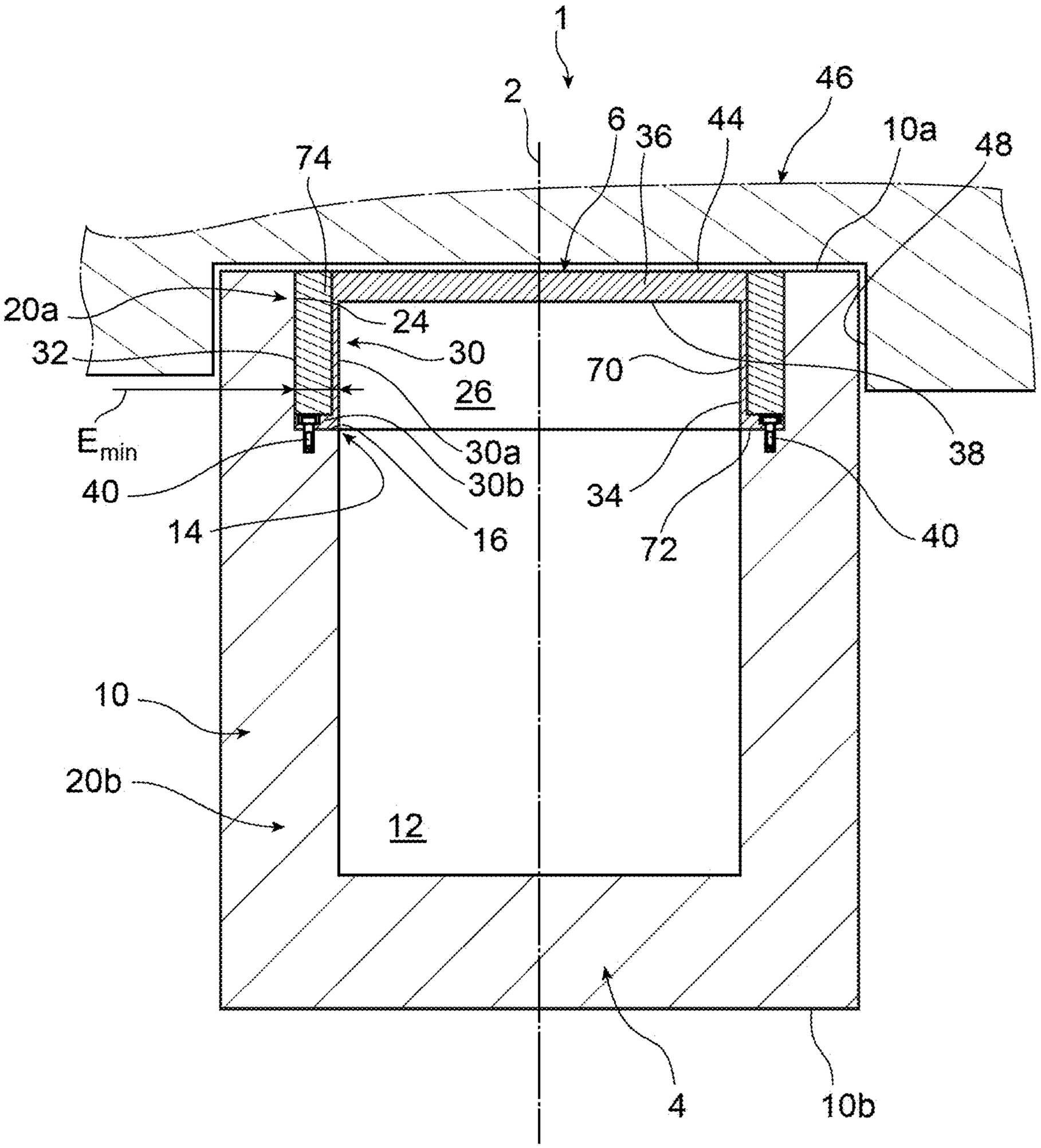
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FIG. 5

PACKAGING FOR TRANSPORTING AND/OR STORING RADIOACTIVE MATERIALS HAVING A DESIGN THAT FACILITATES THE HANDLING OF THE MASS OF RADIOACTIVE MATERIALS

This is the National Stage of PCT international application PCT/FR2019/051454, filed on Jun. 14, 2019 entitled "PACKAGING FOR TRANSPORTING AND/OR STORING RADIOACTIVE MATERIALS HAVING A DESIGN THAT FACILITATES THE HANDLING OF THE MASS OF RADIOACTIVE MATERIALS", which claims the priority of French Patent Application No. 1855265 filed Jun. 15, 2018, both of which are incorporated herein by reference in their entirety.

TECHNICAL FIELD

The present invention relates to the field of packaging for transporting and/or storing radioactive materials, for example radioactive waste placed in barrels, or nuclear-fuel assemblies.

PRIOR ART

From the prior art, numerous designs for packaging for transporting and/or storing radioactive materials are known. Generally, the packaging has a housing cavity receiving a mass of radioactive materials, this cavity being defined by a lateral body, a bottom, and a lid mounted removably on the lateral body.

To extract the mass of radioactive materials, the lid is first of all removed from the main body. Next the mass is gripped by a handling device in order to be extracted from the housing cavity. In order to ensure such extraction, the handling device must be connected to the mass of radioactive materials, for example at a head end of this mass.

Nevertheless, in some cases, the mass requires being gripped at the lateral face thereof by the handling device. A radial clearance is then generally provided between this mass and the internal surface of the lateral body delimiting the housing cavity. Thus the handling device can be introduced axially into this radial clearance, in order to be connected to the lateral face of the mass of radioactive materials. This radial clearance does however lead to oversizing the packaging, with negative consequences in terms of weight, cost and bulk.

DESCRIPTION OF THE INVENTION

To respond to the problem identified below, the object of the invention is packaging for transporting and/or storing radioactive materials according to the features of claim **1**.

Thus, when the lateral-body reconstitution part is removed, the hollowed-out zone procures lateral access to the mass of radioactive materials, easily enabling it to be gripped laterally. This is because the hollowed-out zone allows the introduction of a handling device between the internal surface of the reduced-thickness part of the lateral body, and the mass of radioactive materials.

This facilitated gripping is advantageously obtained without increasing the width of the lateral body, which guarantees control of the costs, of the total weight of the packaging, and the bulk thereof.

Furthermore, the lateral-body reconstitution part makes it possible to reconstitute the thickness of the lateral body locally at the reduced-thickness part thereof, leading to an absence of leakage of shielding.

Finally, at least part of the lid, and preferably the lid in its entirety, can be arranged in the hollowed-out zone of the lateral body defined laterally by the reduced-thickness part of this lateral body. The mechanical strength of the packaging is therefore satisfactory in the event of lateral or oblique falling, since the lid is protected by the lateral body.

The invention moreover has at least one of the following optional features, taken in isolation or in combination.

The reconstitution part extends in an uninterrupted fashion all around the longitudinal axis, in order thus to form a closed structure over 360°, such as for example an annular structure, of constant or variable thickness. Preferably, the reconstitution part is such that the assembly that it forms with the lateral body has constant thickness, in order to procure homogeneous and satisfactory shielding performance. This structure closed over 360° may be produced in a single piece, or by the succession of angular sectors arranged end to end, without clearance.

Alternatively, the reconstitution part extends over only an angular sector of less than 360°, and in this case several reconstitution portions can be provided within the packaging, spaced apart angularly from one another.

The lateral-body reconstitution part:

a) is independent of the lateral body and of the lid; and

b) forms an integral part of the lid, which also comprises a main part for axial closing off of the housing cavity defining an axial end surface of this cavity, the lateral-body reconstitution part being arranged projecting axially in the direction of the bottom from the axial-end surface; or

c) is formed by combining a primary and a secondary lateral-body reconstitution portion,

the primary portion forming an integral part of the lid, which also comprises a main part for axial closing off of the housing cavity defining an axial-end surface of this cavity, the primary portion including firstly a lateral wall forming the internal surface and arranged projecting axially in the direction of the bottom from the axial end surface, and secondly a fixing flange arranged at an axial end of the lateral wall and intended to be in abutment against the transition surface,

the secondary portion being independent of the lateral body and of the lid, and arranged radially between the internal surface of the reduced-thickness part of the lateral body, and the assembly formed by the lateral wall of the primary portion of the lid and the main part of this lid.

The packaging comprises means for fixing the lid on the lateral body, the fixing means passing through the lateral-body reconstitution part as well as the transition surface of the lateral packaging body. This embodiment is preferentially adopted in case b), when the lateral-body reconstitution part is integrated in the lid.

In case c), these fixing means preferentially pass through the fixing flange of the primary portion of the lateral-body reconstitution part. The length thereof may thus be advantageously reduced, passing only through this fixing flange, and not the secondary portion of the reconstitution part.

Alternatively, the fixing means could cooperate with the first axial end of the lateral body, without departing from the scope of the invention. This alternative embodiment is then preferred when the lateral-body reconstitution part is independent of the lateral body and of the lid, the reconstitution part being in this case able to be held axially without clearance or with axial clearance between the lid and the transition surface.

A sealing system is gripped axially between the transition surface of the lateral body and an axial end of the lateral-body reconstitution part. This embodiment is preferentially adopted in the aforementioned cases b) and c).

Here again, the sealing system could alternatively be gripped axially between the first axial end of the lateral body and a portion of the lid covering this end, without departing from the scope of the invention. This alternative embodiment is then preferred in case a), when the lateral-body reconstitution part is independent of the lateral body and of the lid.

The lid is entirely covered laterally by the reduced-thickness part of the lateral body, in order to reinforce the mechanical strength in the event of a fall. Nevertheless, part of this lid could be arranged externally with respect to the lateral body, in the axial direction, and this without departing from the scope of the invention.

The packaging further includes an additional lid fixed to the lateral body.

The packaging further includes an impact-damping cap covering at least part of the lid, as well as the first axial end of the lateral body.

The internal surface of the lateral-body reconstitution part laterally delimits an axial section of the lateral cavity, the axial section extending over an axial length greater than or equal to 50 mm. Preferentially, the length of this axial section corresponding for example to 20% of the total axial length of the housing cavity, and at a maximum to 50% of this total axial length of the housing cavity.

The transition surface of the lateral body forms an internal shoulder. Alternatively, this surface could take other forms providing the transition of thickness in the lateral body, such as an oblique surface, a stepped surface, etc.

An object of the invention is a parcel comprising packaging as described above, loaded with a mass of radioactive materials housed in the housing cavity, the mass of radioactive materials, preferably in the form of a barrel, being located at the part laterally facing the lateral-body reconstitution part.

Another object of the invention is a discharging method according to claim **12**.

Other advantages and features of the invention will emerge in the following non-limitative detailed description.

BRIEF DESCRIPTION OF THE DRAWINGS

This description will be given with regard to the accompanying drawings, among which:

FIG. **1** shows a view in longitudinal axial section of packaging for storing and/or transporting radioactive materials, according to a preferred embodiment of the present invention;

FIG. **2** shows a view similar to the one in the previous figure, in an exploded view;

FIG. **3** is a plan view of the packaging shown in the preceding figures, with the packaging shown without the head damping cap thereof;

FIG. **4** shows a view similar to the previous one, with the packaging being in the form of another preferred embodiment of the invention; and

FIG. **5** shows a view similar to the previous ones, with the packaging being in the form of another preferred embodiment of the invention.

DETAILED DISCLOSURE OF PREFERRED EMBODIMENTS

With reference first of all to FIGS. **1** to **3**, packaging **1** for storing and/or transporting radioactive materials is shown, according to a preferred embodiment of the invention.

This packaging **1** is shown in the vertical storage position, wherein the longitudinal axis **2** thereof is oriented vertically. It corresponds to the aforementioned case b), and includes a packaging bottom **4** opposite to a removable lid **6** in the direction of the height **8**, parallel to the longitudinal axis **2**. In addition to the bottom **4** and lid **6** spaced apart from each other along the axis **2**, the packaging **1** includes a lateral body **10** extending around this axis **2**. The lateral body **10** extends between a first axial end **10***a* on the lid **6** side, and a second end opposite to the first, situated at the bottom **4** side. The lateral body **10** is thus closed by the lid **6** at a first axial end **10***a*, also referred to as the head end. It is also closed by the bottom **4** at the second axial end **10***b*.

The bottom **4** and the lid **6** delimit axially a housing cavity **12** within which a mass of radioactive materials **13** is received, here a barrel sealingly confining radioactive waste. This type of barrel is also known by the term canister. When this mass **13** is housed in the cavity **12**, as shown in FIGS. **1** and **2**, it forms with the packaging **1** a parcel **100**. The housing cavity **12** is also delimited laterally by the lateral body **10**, a specificity of which particular to the invention will now be described.

Internally, this lateral body **10** includes a thickness-change zone **14**, which is represented by a transition surface **16** here in the form of a shoulder. The lateral body **10** thus comprises a reduced-thickness part **20***a*, as well as a greater-thickness part **20***b* separated from the part **20***a* by the shoulder **16**. The reduced-thickness part **20***a* thus extends from the shoulder **16** towards the first end **10***a*. More precisely, it is delimited axially between this shoulder **16** and the first end **10***a* of the lateral body **10**, corresponding to the axial end surface of this body. Moreover, the greater-thickness part **20***b* is delimited axially between the shoulder **16** and the second end **10***b*.

Preferably, the reduced-thickness part **20***a* has a constant thickness. It includes an internal surface **24** laterally delimiting a hollowed-out zone **26** of the lateral body **10**, this hollowed-out zone **26** consequently being delimited axially by the transverse surface of the shoulder **16**, and by the transverse surface of the first end **10***a* of this body **10**. In this preferred embodiment wherein the external surface of the lateral body is cylindrical with a circular cross-section, the internal surface **24** of the reduced-thickness part **20***a* thereof is also preferentially cylindrical with a circular cross-section. Thus the hollowed-out zone **26** is in the form of a cylindrical volume, also with a circular cross-section.

In a similar manner, the greater-thickness part **20***b* also has a constant thickness. It includes an internal surface **28** laterally delimiting the major part of the housing cavity **12**, as far as the bottom **4**. The internal surface **28** of this greater-thickness part **20***b* is also preferentially cylindrical with a circular cross-section, with a diameter less than that of the internal surface **24** of the reduced-thickness part **20***a* of the lateral body.

One of the other particularities of the invention lies in the presence of a lateral-body reconstitution part **30**, which is here in the form a closed ring extending over 360° around the axis **2**, in the hollowed-out zone **26**. This reconstitution part **30** has an external surface **32** with a form complementary to that of the internal surface **24** of the reduced-thickness part **20***a* of the lateral body. In addition, its internal surface **34** laterally delimits a top part of the housing cavity **12**, namely that located above the greater-thickness part **20***b* of the lateral body, that is to say above the shoulder **16**. In this regard, it should be noted that the internal surface **34** of the ring **30** has a form identical or similar to that of the internal surface **28** of the greater-thickness part **20***b*, in order

to result in a housing cavity **12** with a homogeneous and constant shape. This is because the thickness of the part **20***b* of the lateral body is substantial identical to the total thicknesses of the part **20***a*, and of the ring **30** arranged laterally adjacent to this part **20***a*.

The internal surface **34** and the internal surface **24** are concentric, centred on the axis **2**. They are thus spaced apart radially from each other in relation to this axis **2**, so as to have a minimum radial separation Emin greater than 30 mm, or more preferentially greater than 50 mm. Through the concentricity of the surfaces **24**, **34** and through their shapes, the radial separation between them is preferentially constant or substantially constant throughout the circumferential direction.

In this preferred embodiment, the reconstitution part **30** in the form of a ring forms an integral part of the lid **6**. The latter then comprises a main part **36** serving for the axial closure of the housing cavity **12**, this main part **36** being preferentially in the form of a slab arranged orthogonally to the axis **2**. The lid **6** also includes this reconstitution part **30**, arranged projecting axially in the direction of the bottom **4**, from an internal surface of the main axial-closure part **36** corresponding to an axial end surface **38** of the cavity. The two components **30**, **36** of the lid **6** may be produced in a single piece, or attached fixedly to each other, by welding or by equivalent fixing means. Moreover, the lid **6** could also include an impact damper (not shown) at the axial end surface **38** thereof, so that it is axially opposite the head end of the mass of radioactive materials **13**. In a similar manner, such an impact damper could be secured to the mass **13**, or simply placed axially between this mass **13** and the lid **6**.

As can be seen in FIG. **1**, the lid **6**, and in particular the main axial-closure part **36** thereof, is entirely covered laterally by the reduced-thickness part **20***a* of the lateral body **10**. This makes it possible to reinforce the mechanical strength of the packaging in the event of a lateral or oblique fall, since the lid **6** is perfectly protected by the lateral body. This mechanical strength is also provided by means for fixing the lid **6** on the lateral body **10**, which here take the form of a plurality of screwed elements **40** parallel to the axis **2**. These elements **40** pass first of all through the periphery of the main axial-closure part **36**, and then the reconstitution part **30**, in order finally to pass through the shoulder **16** and to come to be screwed in the top end of the part **20***b* of the lateral body. The screwed elements are spaced apart evenly around the axis **2**, and the heads thereof are located in countersinks **42** formed on the external surface **44** of the main axial-closure part **36**. By virtue of these countersinks **42**, the screwed elements **40** do not project from this closure part **36**. This makes it possible to assemble a second lid (not shown) on the lateral body **10**, over the lid **6**, or to make the bottom **45** of an impact-damping cap **46** approach as closely as possible the external surface **44** of the main axial-closure part **36**. This cap **46**, referred to as a head damper cap, provides in effect a base **45** that delimits a hollow **48** wherein a head portion of the reduced-thickness part **20***a* are housed, as well as the closure part **36** of the lid **6**. These two elements are thus covered laterally by the head damper cap **46**, it being moreover specified that a similar base-damper cap **50** laterally covers a bottom portion of the greater-thickness part **20***b*, as well as the bottom **4**.

The packaging also comprises a sealing system axially gripped between the shoulder **16** and a bottom axial end of the reconstitution part **30**. It is a case for example of two seals **54** centred on the axis **2** and arranged at the interface between the aforementioned two elements, inside the fixing crown formed by the screwed elements **40**. These seals provide the confinement of the barrel **13** in the housing cavity **12**, which then forms a confinement chamber.

With this design particular to the present invention, the cavity **12** is thus delimited axially by the bottom **4** and the main closure portion **36** of the lid, and delimited laterally by the two internal surfaces **34**, **28**. Moreover, the internal surface **34** of the ring **30** laterally delimits a top axial section of the cavity **12**, with a length L**1** greater than or equal to 50 mm.

In the loaded configuration of the packaging, and when the lid **6** is fixed on the lateral body **10** as shown in FIG. **1**, the reconstitution ring **30** is pressed axially against the shoulder **16**, via the screwed elements **40**. In this configuration, the shielding is correctly provided at the top part of the lateral body **10**, by virtue of its reconstitution of thickness via the ring **30**. The top part of the barrel **13** is then located laterally opposite this ring **30**, with a preferentially small radial clearance between the two of them. A small axial clearance is also observed between the barrel **13** resting on the bottom **4** in the vertical position in FIG. **1**, and the axial-end surface **38** of the main closure part **36** of the lid **6**.

After the removal of the lid **6** performed during an operation of discharging the barrel **13**, an annular space **56** of the hollowed-out zone **26** is created between the internal surface **24** of the reduced-thickness part **20***a*, and the external surface of a top portion of the barrel **13**. The annular space **56** thus has a radial thickness greater than or equal to 30 mm, and preferably greater than or equal to 50 mm.

This annular space **56**, visible in FIG. **2** and delimited axially towards the bottom by the shoulder **16**, forms a lateral access to the barrel **13** for gripping thereof. This is because a handling device **58** can be introduced axially into this annular space **56** left free and with sufficient radial thickness, in order to be connected to the external lateral surface of the barrel **13**. It is a case for example of drum clamps or a grapnel **58**, which can be easily inserted in the dedicated space **56**, without any need for oversizing the width of the packaging. Once the attachment has been made, the barrel **13** can be extracted axially from the cavity **12**.

FIG. **4** shows another preferred embodiment of the invention, having great similarities with the previous embodiment. Moreover, on all the figures, the elements bearing the same numerical references correspond to identical or similar elements.

In this other embodiment corresponding to the aforementioned case a), the main difference lies in the lateral-body reconstitution part, which is no longer a ring integrated in the lid **6**, but is a ring **30** independent of the lateral body **10** and of the lid **6**. This ring **30** is in fact arranged axially between the lid **6** in the form of a slug, and the shoulder **16** separating the two parts **20***a*, **20***b* of the body **10**.

In this embodiment, the seal or seals **54** can be offset between the first end **10***a* of the lateral body **10**, and the internal surface of the lid **6** covering this end. As a countersink/recess **62** is preferentially provided at the first end **10***a* in order to receive the lid **6**, the seals **54** are thus arranged in the countersink bottom of this first end **10***a*. Likewise, the screwed fixing elements **40** can be arranged here in order to cooperate with the head portion of the reduced-thickness part **20***a*, passing through the periphery of the lid **6** as well as the countersink bottom defined by the first axial end **10***a*.

Finally, in this embodiment, the lid **6** is also entirely covered laterally by the reduced-thickness part **20***a*, being entirely housed in the countersink/recess **62** of the first axial end **10***a*. In the countersink bottom, in the form of a shoulder

as for the transition surface **16**, the seal **54** is moreover situated inside the fixing crown formed by the screwed elements **40**.

FIG. **5** shows yet another embodiment, similar to the previous ones. It corresponds to the aforementioned case c), having the particularity of having a lateral-body reconstitution part **30** formed by two separate elements.

It is a case of a combination of a primary portion **30***a* having great resemblances to the reconstitution part **30** of the embodiment in FIGS. **1** to **3**, and a secondary portion **30***b* having great resemblances to the reconstitution part **30** of the embodiment in FIG. **4**.

This is because the primary portion **30***a* forms an integral part of the lid **6**, which also comprises the main axial-closure part **36** of the housing cavity **12**. More precisely, the primary portion **30***a* includes first of all a lateral wall in the form of a thin ring **70**, projecting downwards from the axial end surface **38** defined by the main portion **36** of the lid. The ring **70** is centred on the axis **2**, and the internal face thereof forms the internal surface **34** radially delimiting the cavity **12**. At the axial end thereof opposite to the one connected to the main portion **36**, the ring **70** carries fixedly a fixing flange **72**. The latter adopts the form of a thin disc centred on the axis **2**, projecting radially outwards from the ring **70**. The radial extent thereof corresponds substantially to that of the shoulder **16**, against which it is intended to come into abutment. To do this, the screwed elements **40** form a crown, each element of which passes through the fixing flange **72**, and then the shoulder **16** in order to press these two elements **72**, **16** against each other. The length of the screwed elements **40**, necessary for fixing the lid **6**, thus proves to be particularly small compared with the similar elements in the case b) shown in FIGS. **1** to **3**.

If the fixing flange **72** is capable of reconstituting the thickness of the lateral body **10** in the vicinity of the shoulder **16**, there remains, after the fixing on the lid **6**, an annular space **74** between the internal surface **24** and this same lid. This space is entirely or partially filled in by the secondary portion **30***b* of the reconstitution part **30**. This secondary portion **30***b* is independent of the lateral body **10** and of the lid **6**, like the reconstitution part **30** of case a) shown in FIG. **4**.

It takes the form of another ring **30***b*, one of the axial ends of which is in abutment against the flange **72** axially delimiting the annular space **74**, and the other axial end of which is located close to or in the plane of the first end **10***a*, and/or close to or in the plane of the external surface **44** of the main closure part **36**. Radially, this ring **30***b* is located between the internal surface **24** and the radially external surface of the assembly formed by the ring **70** of the primary portion **30***a*, and the main part **36** of this lid. In this regard, it should be noted that the main part **36** and the primary portion **30***a* can be produced in a single piece, or more preferentially by assembling a plurality of elements with one another, preferably by welding.

The axial locking of the reconstitution ring **30***b* takes place through the bottom of the head damping cap **46**, or by the presence of an additional lid (not shown) axially covering the lid **6** and fixed to the body **10**. This additional lid may moreover be provided in all the other embodiments described previously.

Naturally, various modifications can be made by a person skilled in the art to the invention that has just been described, solely by way of non-limitative examples and in accordance with the scope defined by the accompanying claims. In particular, the various preferred embodiments can be combined with one another.

What is claimed is:

1. A packaging for transporting and/or storing radioactive materials, the packaging delimiting a housing cavity intended to receive a mass of radioactive materials, said housing cavity being at least partly defined by a lateral body, a bottom and a lid mounted removably on the lateral body, the bottom and the lid being spaced apart from each other along a longitudinal axis of the packaging, and the lateral body extending between a first axial end on the lid side and a second axial end on the bottom side,

wherein the lateral body has a thickness-change zone defining a transition surface, the lateral body comprising a reduced-thickness part extending from the transition surface towards the first axial end of the lateral body, said reduced-thickness part comprising an internal surface laterally delimiting a hollowed-out zone of the lateral body, also delimited axially by the transition surface,

wherein the packaging comprises an insert body extending around the longitudinal axis, arranged removably in said hollowed-out zone, and having an internal surface laterally delimiting a part of the housing cavity,

and wherein the internal surfaces are spaced apart from each other so as to have a minimum radial separation greater than 30 mm.

2. The packaging according to claim **1**, wherein the insert body:

a) is independent of the lateral body and of the lid;

b) forms an integral part of the lid, which also comprises a main part for axial closing off of the housing cavity defining an axial-end surface of said housing cavity, the insert body being arranged projecting axially in the direction of the bottom from the axial-end surface; or

c) is formed by combining a primary portion,

the primary portion forming an integral part of the lid, which also comprises a main part for axial closing off of the housing cavity defining an axial end surface of said housing cavity, the primary portion including firstly a lateral wall forming the internal surface and arranged projecting axially in the direction of the bottom from the axial end surface, and secondly a fixing flange arranged at an axial end of the lateral wall and configured to be in abutment against the transition surface,

the secondary portion being independent of the lateral body and of the lid, and arranged radially between the internal surface of the reduced-thickness part of the lateral body, and the assembly formed by the lateral wall of the primary portion and the main part of said lid.

3. The packaging according to claim **2**, further comprising means for fixing the lid on the lateral body, the fixing means passing through the insert body and the transition surface of the lateral body.

4. The packaging according to claim **3**, wherein, in case c), said fixing means pass through the fixing flange of the primary portion of the insert body.

5. The packaging according to claim **1**, wherein a sealing system is gripped axially between the transition surface of the lateral body and an axial end of the insert body.

6. The packaging according to claim **1**, wherein the lid is entirely covered laterally by the reduced-thickness part of the lateral body.

7. The packaging according to claim **1**, it further comprising an additional lid fixed to the lateral body.

8. The packaging according to claim **1**, further comprising an impact-damping cap covering at least part of the lid, as well as the first axial end of the lateral body.

9. The packaging according to claim **1**, wherein the internal surface of the insert body laterally delimits an axial section of the housing cavity, the axial section extending over an axial length greater than or equal to 50 mm.

10. The packaging according to claim **1**, wherein the transition surface of the lateral body forms an internal shoulder.

11. A parcel comprising the packaging according to claim **1**, loaded with a mass of radioactive materials housed in the housing cavity, the mass of radioactive materials being located partly laterally opposite the insert body.

12. A method for discharging a mass of radioactive materials housed in the housing cavity of the packaging according to claim **1**, the method comprising the following steps:

removing the lid and the insert body, so as to release an annular space of the hollowed-out zone between the internal surface of the reduced-thickness part and an external surface of a top portion of the mass;

introducing a handling device into the annular space, in order to connect the handling device to the external surface of the mass; and

extracting the mass out of the cavity, by means of the handling device.

13. The parcel according to claim **11**, wherein the mass of radioactive materials is in the form of a barrel.

14. The packaging according to claim **1**, wherein the insert body is a ring.

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